



Three new records of lichenised fungi from India

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Abstract

Three lichen species, namely *Amandinea errata* and *Baculifera xylophila*, belonging to family Caliciaceae, and *Baeomyces rufus*, of family Baeomycetaceae, are newly reported for the Indian lichen biota. A brief morphotaxonomic description of each species, along with their ecology and distribution, is also provided.

Keywords

Crustose lichen, Kashmir Himalaya, Sinthan.

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Introduction

The Kashmir Valley, often called “the paradise on Earth”, is a beautiful valley nearly 16,000 km² enclosed in a magnificent amphitheatre of mountains. It harbours a rich diversity of flora and fauna, besides lichens. Mukhtar et al. (2006) made exhaustive collections of lichens in a few forest areas in Kashmir Himalaya and reported the occurrence of 176 lichen taxa. Haq et al. (2013) reported 21 species of lichens from the urban areas of Kashmir. While studying the elevational patterns of lichen communities in Zaskar valley, Kumar et al. (2014) reported the occurrence of 24 lichen species. Goni and Sharma (2015) added 44 lichens from Jammu region of Jammu and Kashmir. Goni et al. (2015) updated the checklist of lichens of Jammu and Kashmir, listing 356 species.

Our study was carried out from Daksum to Sinthan Top, a mountain pass near Daksum, along an elevational gradient from 2300 to 3800 m (Fig. 1). This area is part of the western Himalayan lichenogeographic region (Singh

et al. 2004) and is one of the representative altitudinal ranges of Kashmir Himalaya. Our study area lies 40 km from Anantnag and about 85 km from Srinagar. The area above 2500 m remains snow-covered from December to April and has an average annual temperature of 12.8 °C and annual precipitation of 1035 mm. *Abies pindrow*, *Picea smithiana*, *Pinus wallichiana*, *Prunus cornuta*, *Acer* spp., *Rhododendron* spp., *Juniperus communis*, and *Betula utilis* are the major elements of the vegetation. During our exploration, around 600 lichen specimens were collected, which revealed the occurrence of 3 species of lichens new to Indian lichen flora.

Methods

The lichen specimens were collected from May to October 2017 from all the available substrates. The collected lichen specimens were air dried, curated, and examined according to the standard lichenological procedures. Samples were morpho-anatomically examined under

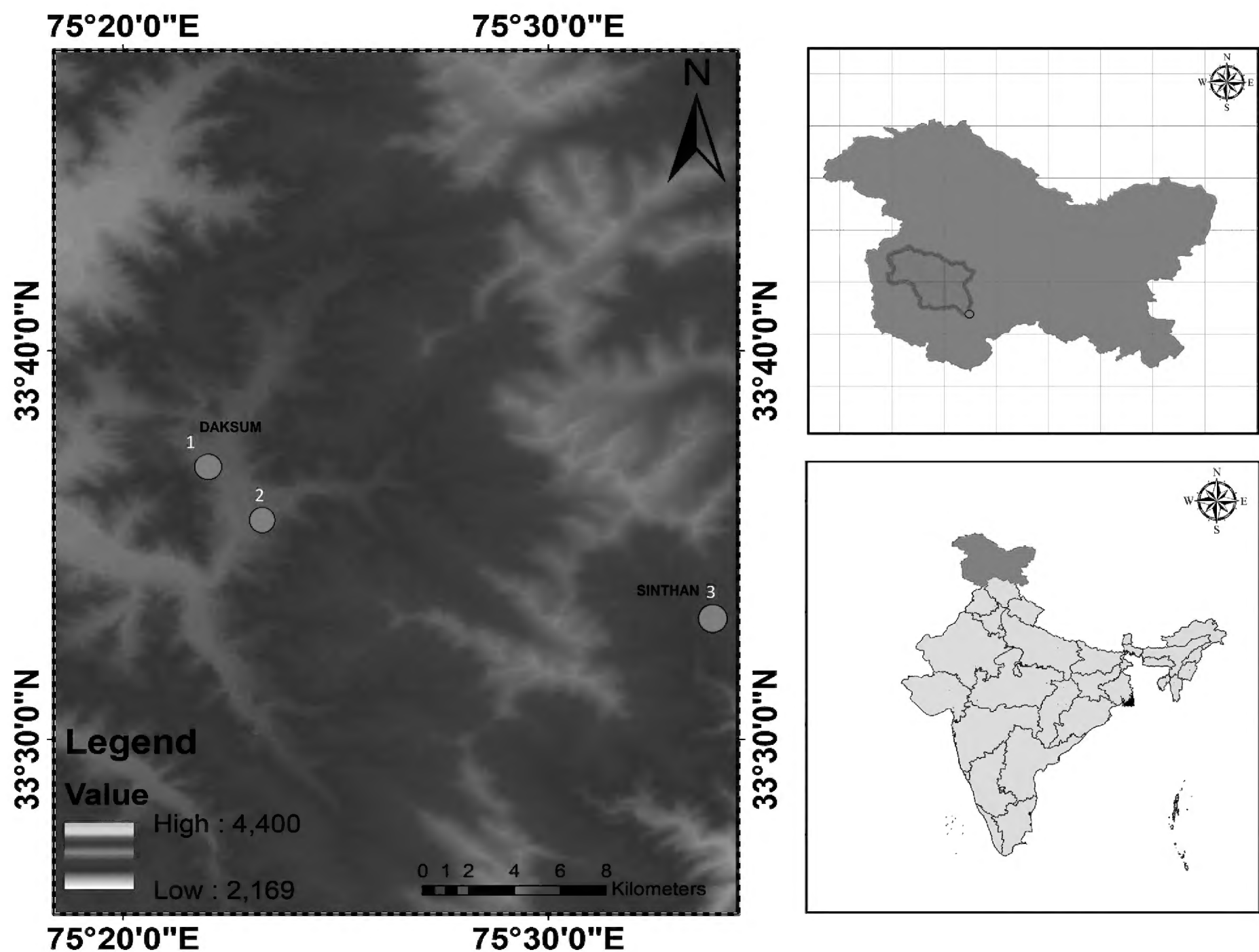


Figure 1. Map showing the study area and location of the new records: 1 = *Amandinea errata*; 2 = *Baculifera xylophila*; 3 = *Baeomyces rufus*.

stereomicroscope-Leica S8 and Leica DM 500. Spot tests and UV light were utilized for the study of lichen chemistry. Thin-layer chromatography, as described by Orange et al (2001), was used to identify the secondary metabolites in solvent system A (180 ml Toluene: 60 ml 1, 4-dioxane: 8 ml acetic acid). Relevant keys and monographs (Awasthi 1991, Awathi 2007, Singh and Sinha 2010, Sipman 2003, Sinha et al. 2018) were used for confirmation of identification and distribution of taxa. The authenticated specimens were deposited at the National Botanical Research Institute, Lucknow (LWG) and the Department of Botany, University of Kashmir, Srinagar, India (KASH).

Results

Three new records of lichens from India were identified and reported from the Daksum-Sinthan Top area (Fig. 1).

***Amandinea errata* Marbach**, *Bibliotheca Lichenol.* 74: 68 (2000)

Figure 2A, B

Specimen examined. India, Kashmir, Daksum (33°36' 48" N, 075°26'40" E, 2400 m alt.), from rough bark of *Abies pindrow*, LWG-032310, Manzoor-Lcn 100 (KASH).

Description. Thallus crustose, corticolous, upper surface

greyish, epruinose, prothallus absent; apothecia immersed, disc flat to convex, up to 5mm in diameter; hypothecium hyaline to pale brown; hymenium not inspersed, 70–80 µm; epithecium dark brown; ascospores slightly brown, 8–16 per ascus, 1-septate, 12–15 × 5–6 µm, thin-walled; thallus and medulla K–, C–, KC–, Pd–, UV–.

Amandinea extenuata (Müll. Arg.) Marbach, *A. endachroa* (Malme) Marbach, and *A. brugierae* (Vain.) Marbach are other species of *Amandinea* with ascospores closely similar in shape and size to those of *A. errata*. However, *A. brugierae* and *A. endachroa* differ in having atranorin in the thallus while *A. extenuata* differs in having a yellow to dark-brown hypothecium. *Amandinea errata* was earlier reported from South America and is now reported as a new record for India.

***Baculifera xylophila* (Malme) Marbach**, *Bibliotheca Lichenol.* 74: 148 (2000)

Figure 2C, D

Specimen examined. India, Kashmir, Daksum (33°36' 48" N, 075°26'40" E, 2400 m alt.), from bark of *Abies pindrow*, LWG-032311, Manzoor-Lcn 101 (KASH).

Description. Thallus crustose, corticolous, white to grey, slightly warty; apothecia 0.4–0.5 mm in diameter, sessile to slightly immersed; disc flat, epruinose, margin epruinose; excipulum 15–40 µm, thick, dark

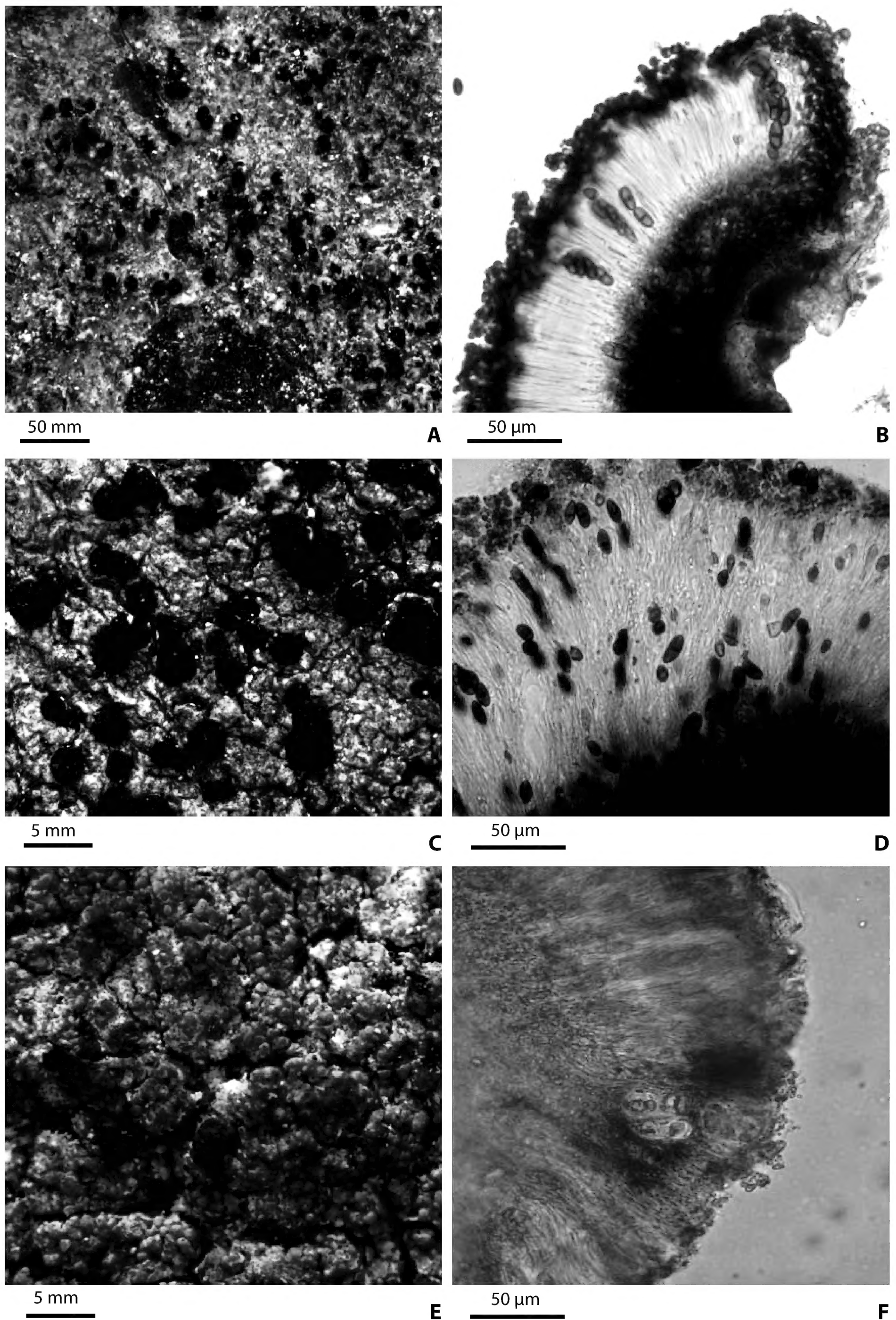


Figure 2. **A, B.** *Amandinea errata*: **(A)** habitus; **(B)** section through apothecia. **C, D.** *Baculifera xylophila*: **(C)** habitus; **(D)** section through apothecia. **E, F.** *Baeomyces rufus*: **(E)** habitus; **(F)** section through apothecia.

brown to carbonaceous, K⁻; hypothecium dark brown to carbonaceous; hymenium 70–120 µm, not inspersed; epithecium olive-green to dark brown; ascospores *Buelia*-type, brown, 8/ascus, 1-septate, 12–20 × 6–10 µm, thin septa, thin or slightly subapically thickened walls, finely sculptured; thallus, cortex and medulla; K⁻, C⁻, KC⁻, Pd⁻, UV⁻.

This species shows close resemblance with *Baculifera micromera* (Vain.) Marbach, *Amandinea longloisii* Imshaughi & Marbach, and *A. submontana* Marbach in shape and size of the ascospores. Both *Baculifera micromera* and *Amandinea longloisii* differ in having a non-carbonaceous hypothecium. *Amandinea submontana* differs in having atranorin in the thallus.

***Baeomyces rufus* (Hudson) Rebent**, Prodrumus Flora Neomarchicae: 315 (1804)
Figure 2E, F

Specimen examined. India, Kashmir, Sinthan Top (33° 34'10" N, 075°30'65" E, 3800 m alt.), from soil, LWG-032312, Manzoor-Lcn 102 (KASH).

Description. Thallus dimorphic; primary thallus crustose, terricolous, green to dull green, nodulose, compactly squamulose, esorediate, schizidia present; secondary thallus podetoid; apothecia: subterminal, dark red-brown, incurved at base; ascospores not seen in the specimen examined; thallus K⁺ yellow, C⁻, KC⁺ yellow, Pd⁺ orange; stictic acid and norstictic acid.

Baeomyces sorediifer Nyl., the other terricolous species of *Baeomyces* from India, is known from the Palni Hills in the South Western Ghats. It differs with *B. rufus* in having a sorediate primary thallus. This species was earlier reported from Brazil, Uruguay, Australia, Sri Lanka, and Hawaii and, now, India.

Discussion

During the course of our identification of about 600 specimens of lichens from an elevational gradient from Daksum to Sinthan Top in Kashmir, 3 species of lichens were found to be new records for the lichen biota of India. All three species are crustose. Two species (*Amandinea errata* and *Baculifera xylophila*) are corticolous and the third species (*Baeomyces rufus*) is terricolous.

The occurrence of *Baeomyces rufus* only at higher elevations in Kashmir (north Himalaya) is indicative of the warming of Himalaya which may have extended the geographic distribution of the genus *Baeomyces*. Until now, this genus was reported from the Eastern Himalaya only (Rai et al. 2015).

The presence of the 3 newly recorded species at only 1 study site in Kashmir Himalaya reveals that this region is unexplored despite being lichenologically important.

Thus, it is quite likely that additional lichen taxa could be found in the region with further surveys.

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Authors' Contributions

MUH collected the material, made all the descriptions and wrote the manuscript. ZAR collected part of the material and co-wrote the manuscript draft. DKU identified the material.

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